

ANNUAL REPORT
OF THE
CANAL ZONE
**Plant Introduction
Gardens**

For the Fiscal Year
1924



THE PANAMA CANAL PRESS
MOUNT HOPE, C. Z.
1924



00-33-3

ANNUAL REPORT

OF THE

CANAL ZONE

Plant Introduction Gardens

For the Fiscal Year

1924



THE PANAMA CANAL PRESS
MOUNT HOPE, C. Z.
1924



For additional copies of this publication address The Panama Canal, Washington, D. C., or Balboa Heights, Canal Zone.

ANNUAL REPORT

BALBOA HEIGHTS, C. Z., *July 20, 1924.*

Mr. R. K. MORRIS,
Chief Quartermaster,
Balboa Heights, C. Z.

SIR: I have the honor to submit the following report of operations of the Plant Introduction Gardens for the fiscal year ended June 30, 1924.

In July, 1923, work was completed on the greenhouses of the Summit Plant Introduction Gardens. Three of the old poultry houses were used for this purpose after modifications and additions. Land was cleared and the first field plowed and made ready for planting as soon as possible. As soon as work had progressed sufficiently, I was authorized to make a trip to Washington, D. C., to visit the Department of Agriculture, and I obtained a large number of valuable plants and brought them back to the Canal Zone. These plants were the first plant inhabitants of the Plant Introduction Gardens. Shortly afterwards a number of plants were donated to the gardens by the District Quartermaster at Pedro Miguel, these had been obtained by him the previous year from Washington, D. C. Thus a fair start was made, and during the year many new additional plants and seeds were received both from Washington and other places.

Seeds and plants of the local flora were also collected for propagating purposes, and at present our collection comprises at least 500 species represented by many thousands of young plants. During a trip made in November, 1923, to Costa Rica, I succeeded in obtaining approximately 50 new plants, many of which promise to be of value to the Canal Zone.

The first operations of the Plant Introduction Gardens also included the planting of seeds for stock plants of mangos, avocados, and citrus. In the following paragraphs are mentioned somewhat in detail the more important activities carried on during the year.

FIBER PLANTS.

ABACA.

A shipment of bulbs of several varieties of the Manila fiber banana were received during the year. Unfortunately they were all dead upon arrival. It would be of great importance to get the cultivation of Abacá started in the Western tropics. With the recent enactment of a law in the Philippines prohibiting the exportation of Abacá plants, it has been made still more difficult to obtain planting material. The possibility of sending seeds here from the Philippines has been taken up with the Bureau of Fiberplant Investigation of the Department of Agriculture, and seeds of two varieties of Philippine Abacá have just been received. Experiments are being conducted at Summit with plants raised from seed obtained in Costa Rica. Although this method means long drawn out selection work among unknown seedlings, there is just a possibility that a fiber worth while may be obtained. Other fiber plants being tried out are the Boehmeria nivea, Ramie fiber, and *Agava siselana*, Sisal hemp.

RUBBER.

The important question of raising a high grade of commercial rubber in the Canal Zone has been taken up. During the year, two distinct committees were sent out from Washington in order to investigate the rubber possibilities in the Canal Zone. The members of these committees traversed most of the rubber-growing countries of South America in search of seeds of Para Rubber, *Hevea brasiliensis*, and have turned a fair quantity of seeds over to the Summit Gardens. About 500 young Hevea trees are now found growing there from seeds of different origin. It is the intention gradually to plant these trees out in suitable places on the Atlantic side of the Isthmus, where the rainfall may be sufficiently heavy for Para Rubber. About 100 trees have already been set out in the Monte Lirio district.

Besides Para Rubber the following rubbers have been planted for experimental purposes and are found in the Summit Arboretums: *Fontumia elastica*, *Castilla panamensis*, *Manihot glaziovii*, *Landolphia* sp., *Mimusops balata*, *Cryptostegia grandiflora*, and *Achras Sapote*, some of which, apart from a botanical interest, may prove to be of economic importance.

FRUITS.

Considerable attention has been given to the introduction and propagation of superior varieties of fruits. If plenty of such fruits were raised

on the Isthmus a new and profitable industry would undoubtedly be opened up, and a good market should readily be found, both locally and through steamers transiting the Canal.

CITRUS.

The local and hardy sour orange was used for stock and a large quantity of seeds were planted on which to bud desirable varieties of Citrus. Most of this stock is still rather small for extensive budding. All sufficiently large stockplants, however, are being used and by next year a considerable number of budded trees will be available. A collection of about 30 different Citrus relatives were received from Washington, mainly to be tried out for their possibilities as stockplants. They were all planted in a special field where they can be kept under surveillance.

MANGOS.

The local mango has been used for seedling stock, and several thousand young, sturdy plants were grown. At the present most of these have been budded, and the growing buds are in very fine condition. A good deal of budwood was received from Florida through the Department of Agriculture at Washington. In all cases this budwood did not stand the trip well. It was possible, however, to save practically enough of all varieties sent to ensure a start for future propagation, and a varietal orchard has been commenced at Summit. At the present time the collection contains some 15 varieties of the fiberless and turpentine-free mango. Besides the budding of young seedling stock the Summit Gardens during the year, topworked a large number of older mango trees with the superior varieties found in the region from Paraiso to Ancon and Balboa. This was done to improve the quality of the future fruit supply, and partly to extend the sources of budwood for future propagation.

AVOCADOS.

Seeds from local seedling trees were planted in the Summit nurseries for stock. Heavy rains have at times caused some difficulty in getting the avocado buds established. At this moment, however, a considerable number of the Guatemalan Avocados are making a vigorous growth. Several of the West Indian varieties are also being propagated as well as the best of local selections. Among the latter are some very excellent fruits. At Pedro Miguel the District Quartermaster has done some excellent work with the inarching of the avocado and has commenced

an orchard of several varieties. The Summit Gardens will cooperate with this work with the object of getting an avocado orchard of superior varieties established at Pedro Miguel.

PINEAPPLES.

It seems fair to assume that good pineapples might be grown in many sections of the Isthmus. The small farmer, at least should find pineapple growing a profitable undertaking. The pineapples now found on the Isthmus vary considerably in quality. In order to test out these various kinds of pineapples, and to be able to supply planting material, about three acres were planted with pineapples at the Summit Gardens. Seeds for this planting were obtained from Monte Lirio, Corozal, Gamboa, and Taboga, in order to cover a wide range of difference in quality.

PAPAYAS.

Good papayas are universally liked and a good deal of interest is constantly shown in the planting of this fruit for home consumption. The main difficulty seems to lie in the failure of the payaya plant to remain true to seed and in producing a great number of unfertile or inferior plants. A strain now growing at the Summit Gardens promises to be of a very superior quality and of a high percentage of fruiting individuals. It is being propagated as rapidly as possible for further tests and distribution.

BANANAS.

So far extensive tests with bananas were not conducted. Some new varieties were introduced however. The "Lackatan," apparently immune to the banana wilt, was obtained in Costa Rica. From that country was also obtained the hardy "Congo," the "Chinese" Banana, the "Datila," and two particularly good plantains. That these introduced bananas stayed healthy in Costa Rica in places where they were surrounded by fields thoroughly infested with banana wilt may have a particular interest and importance to the Isthmus, where the banana wilt is spreading in ratio with the extension of the banana plantings.

MANGOSTEENS.

This very delicious Eastern fruit is exceedingly hard to propagate, and seems to adapt itself with difficulty to conditions outside of its own home. Two trees are on the Isthmus, now about 7 feet tall, but not yet

bearing, and about 3 years old. Through inarching and budding from these trees, the Summit Gardens expect to raise about 12 plants this year, and about 10 more have been raised from Trinidad and Jamaica seeds.

VARIOUS FRUITS.

Many fruits beside the above-mentioned have been propagated and introduced by the Summit Gardens. Some of the more important are listed below, but as yet these have not been subjected to extensive tests: *Eugenia uniflora*, Pitanga; *Flacourtie Ramontchi*, Governor's Plum; *Achras Sapote*, Sapodilla (an unusually large variety of this delicious fruit from Dutch Guiana); *Annona diversifolia*, Cherimoya; *Averrhoa Carambola*, Carambola; *Canarium Commune*, Pili nut; *Clausena Lansium*, Wampe; *Litchie chinensis*, Lichi; *Eugenia Dombey*, Dombey plum; *Doryalis Kaffra*, Kafir plum; *Eryobotrya japonica*, Loquat; *Eugenia malaccensis*, Malacca apple; *Ficus Carica*, Fig; *Zizyphus jujube*, Jujuba; *Macadamia ternifolia*, Queensland nut; *Artocarpus integrifolia*, Jack-fruit; *Eugenia sp. sp.*, Cherries; *Malpighia punicifolia*, Surinam cherry; *Myrciaria cauliflora*, Jaboticaba; *Peireskia aculeata*, Barbados Gooseberry; *Psidium Friederichsthalianum*; Acid Guava; *Rubus sp.* Raspberry; *Syzygium Cumini*, Jambolan; *Blighia Sapida*, Akee; *Passiflora ligularis*, Granadilla; *Spondias dulcis*, Golden Apple.

FORAGE CROPS.

A number of forage crops have been tried, several of which show a very luxuriant growth. During the prolonged dry season of the Canal Zone, difficulty is often experienced in raising green feed in sufficient quantities. At least one of the new grasses seems, to some extent, to be destined to solve this problem. Reference is made to the Napier grass, *Pennisetum purpureum*, from South Africa. Three distinct strains of this grass were grown at Summit during the year, and all are doing well. While our plots so far have not been large enough to run any definite experiments as to tonnage, and we are not equipped for analytical tests, it has been possible to obtain encouraging notes on the growth of this grass. During the entire dry season of the past year it did not suffer in the least, but stayed green and succulent, yielding a satisfactory cutting about every 9 weeks. For best results it should be cut before the flower stalks commence to appear at a height of about 5 feet. When in full blossom the height is about 8 or 9 feet. Many cattlemen visited the Summit forage plots and showed much interest in the Napier Grass. A

large quantity of cuttings were distributed to dairymen in Panama as well as in the Canal Zone, and it should be a question of but a short time when this grass is universally grown on the Isthmus.

Guatemala grass, *Tripsacum laxum*, is another tall grass of promise. It is a vigorous grass, although of a somewhat slower growth than the Napier grass if planted in dry locations. Once established, however, it seems to stand the drought well. Its stalks and leaves are coarser than those of the Napier grass and it grows to a height of 8 feet without blossoming.

Japanese sugar cane.—A plot was planted with this drought-resisting and high yielding cane in order to try it out as a fodder plant.

E. K. 28 is a new sugar-cane from Java, of which a few cuttings were obtained.

Molasses grass, Melinis minutiflora.—A plot planted of this grass is of very dense growth and gives promise of being a good pasture grass. It is slow in coming to maturity, and so far has seeded but sparsely.

Jaragua grass, Andropogon rufus.—This grass grew to a height of about 4 feet. When 3 months old it was in full bloom, the spikes reaching a height of 4 feet. It grows into large tufts well supplied with leaves, and appears to be very drought resistant. The seeds germinate readily and the grass shows great facility in getting itself established; it will likely be of importance as a haygrass.

Sudan grass, Sorghum sp..—The experiments with this grass so far have shown but poor promise. Although the growth at first is satisfactory, attacks of rust soon make the forage of but little value. In very arid sections this grass may be of more value.

Rhodes grass, Chloris guayana.—A small plot of this grass shows promise as a hay and pasture grass. The seeds seem to have difficulty in germinating in the field, and it was found necessary to start them in nursery beds. After this the growth was rapid, and maturity was reached in 3 months, growth apparently not being checked by drought.

Dallis grass, Paspalum dilatatum.—This is another pasture grass of draught-resisting qualities which, once established, bids fair to be of importance.

Java grass, Polytris praemorsa, is a promising rapidly growing lawn-grass.

GRAIN CROPS.

Test plantings were made of about 8 distinct Sorghums and Millets. They all matured well formed seedheads and are being planted again for further tests. The Shallu Sorgho seemed one of the more promising.

Rice.—In cooperation with the Bureau of Cereal Crops, of the Department of Agriculture, Washington, 25 selections of rice were planted. This experiment is in continuation of selection work commenced at Porto Rico and Santo Domingo in 1918. All of the selections were closely noted as to growth and yield and are now again planted for further tests. Last year's tests showed R. D. 148 and P. R. 358 as the most promising. It is hoped by continual selection to establish a pure and high-yielding strain of a non-irrigated rice suited to our climate.

LEGUMINOUS COVERCROPS.

Tests are being run with the planting of leguminous covercrops. All of the following cowpeas grew satisfactorily: Brabham, Early Buff, Groot, Victor, making a luxuriant growth and maturing seeds.

The following velvet beans were planted: Tracy's Early, Bush Velvet, Porto Rican Velvet Bean, Early Arlington, Georgia. There is no apparent difference in their value as a luxuriant covercrop; they all produce an immense quantity of green matter, of value as a green manure, as protein cattle feed, and as a covercrop, easily coping with and keeping down the wild weed vegetation.

None of the following Soy beans grew to satisfaction, possibly on account of lack of proper inoculation; Biloxi, Laredo, Peking, Tokio Virginia, Wilson.

FORESTRY.

A very large number of trees have been grown, some of value as ornamentals, others as important shade or timber trees. In many regions of the Canal Zone the lands have been denuded of all forest growth, many pastures being almost without trees. Every day the forests on large tracts of land is being cut down to give room for the planting of bananas. With such conditions prevailing the question of tree planting becomes an important one. Several of the more valuable native trees are in course of being propagated at the Summit Gardens. Likewise a number of foreign trees were introduced. Among the more important of these are such as the *Bambus balcooa*, one of the *Bambus* so extensively used in the Far East for building purposes. It will grow canes 70 feet long and is making a rapid growth at the Summit Gardens. The rapid growing Australian trees are represented by *Eucalyptii*; *Grevillea robusta* and *Casuarina equisetifolia*, all of which should do well on our beaches in exposed locations. Among the good timber trees which have been

introduced, the following are worthy of mention: The *Sweetenia mahogany*, West Indian Mahogany; *Tectona grandis*, Teaktree; *Terminalia myriocarpa*; *Elaeocarpus siamensis*.

Among the ornamentals attention has been given to the propagation of a large number of both local and foreign plants. The palm collection contains over 30 species, many of which are already set out on the piece of land where the palm garden is to be established, while others, yet too small to be transplanted, are still in the greenhouses.

An orchid collection has also been commenced and at present contains 35 species of Central American orchids. Some of these were collected in the Canal Zone, Panama, and Costa Rica, while several were donated to the gardens by Mr. Powell, the orchid grower of Balboa.

MEDICINAL PLANTS, DRUGS, AND BEVERAGES.

In connection with the work of the Summit Gardens, 10 acres were cleared and planted with *Taraktogena Kurzii* the Chaulmoogra Oil Tree of Burma. The land where this new plantation is being established is at Flat Rock on the Chagres River. The 800 trees planted were received from the Bureau of Plant Industry, Department of Agriculture, Washington, D. C. They are as yet very small, but at present look strong and healthy, and the probabilities are good that this Chaulmoogra tree plantation will become of importance as a future means of curing the loathsome disease of leprosy.

Oncoba echinata.—More than 100 were planted of this East African shrub, most of them making satisfactory growth. It is thought that this plant may be another source of Chaulmoogra Oil, possessing the advantage of reaching a bearing age earlier than the *Taraktogena Kurzii*.

Stevia rebaudiana.—This plant has been propagated for the sake of its leaves, containing a sugar which may be of use in treating Diabetes patients.

Coffee.—About 8 different species of coffee of both the Arabian and the Liberian group were planted in the field for trial.

Cacao.—Several selections were made among locally grown Cacao trees

Ilex paraguensis, Mate.—A number of plants were received from the U. S. Department of Agriculture of this shrub, the dried leaves of which yield the tea which is a national drink in large parts of South America. The first plants set out in the field made but a slow growth.

Cola acuminata, Kola nut.—Several of these trees were planted in the Arboretum, the seeds of which have value in the preparation of beverages.

Pimento acris, *Cassia farnesiana*, and *Canangium odoratum* are among the perfumery plants of the arboretum.

VEGETABLES.

So far but little work has been done along the line of vegetable growing, for which time and labor did not suffice. An experimental planting has been made of a tomato, which has given promise of standing the heat and the heavy rains of the tropics well, and may help to solve the difficulty experienced in growing tomatoes during the rainy season.

A test planting has been made of 5 varieties of sweet potatoes from the West Indies and Costa Rica, 3 varieties of yams, 4 varieties of tanyias, and 2 varieties of cassava.

MISCELLANEOUS.

About 300 persons visited the gardens at different times, many of them returning with frequency. The West Caribbean Training School, the Instituto Nacional de Panama, and La Escuela Normal de Institutoras, of Panama made excursions to the gardens with their teachers and pupils, to whom practical demonstrations and lectures were given on the various branches of plant industry. Upon the whole the interest taken in the Gardens by persons interested in plant life increased noticeably during the last 6 months.

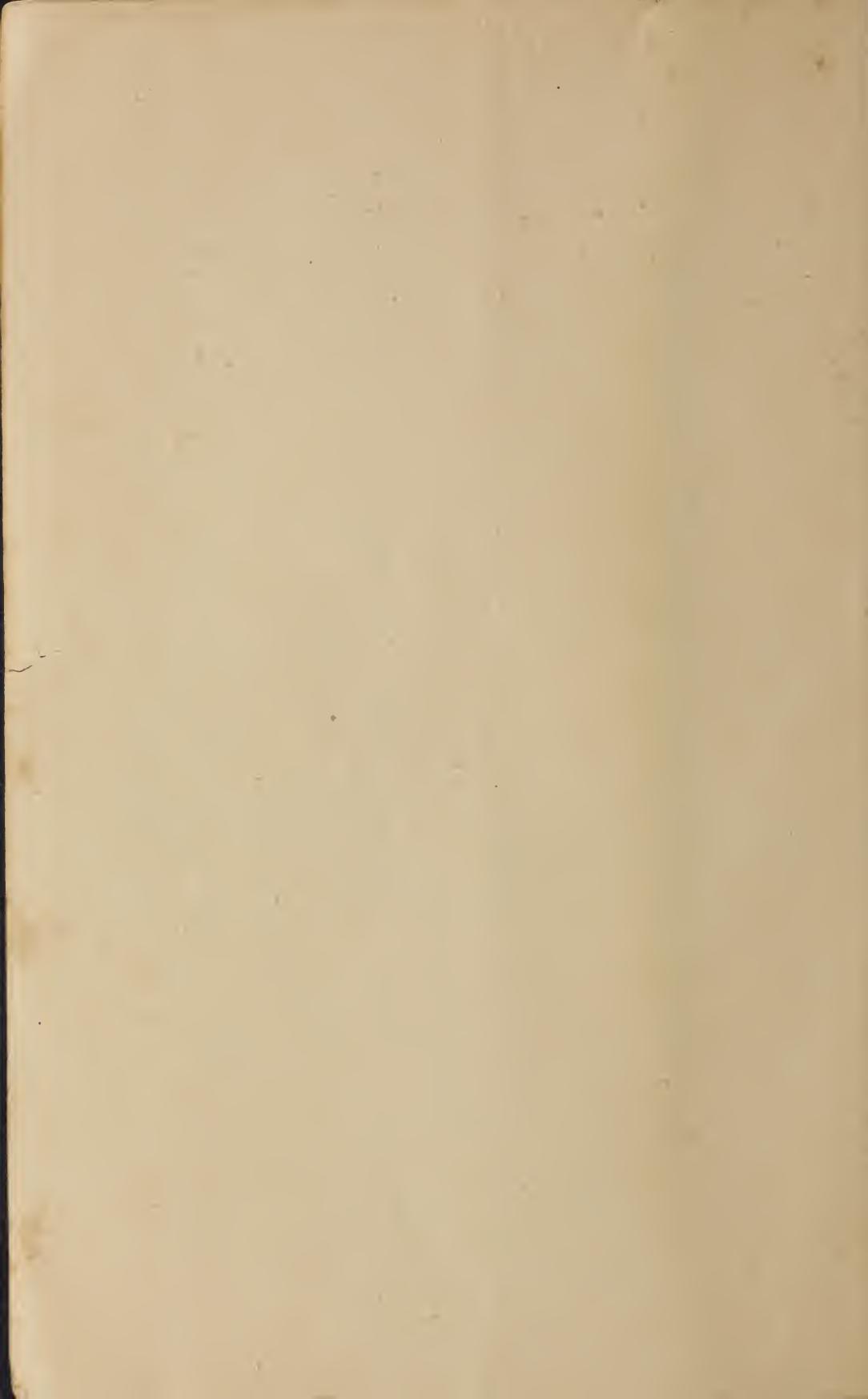
I also made numerous visits to farms and gardens and was consulted daily outside of the Summit Gardens proper by persons seeking information on problems connected with plant growth.

Approximately 2,000 plants were distributed, both ornamentals, trees, and fruit-bearing plants, and on several farms, budding and pruning were done by employees of the Gardens. Arrangements have also been made to secure a fair amount of vegetable seeds which will be used for distribution to farmers of the Canal Zone. Much seed of forage crops was also distributed. A collection of valuable trees of various kinds were set out on the lands of the Frijoles plantation.

Respectfully submitted.

HOLGER JOHANSEN,
Agronomist.





6

7

8

9

10

11

UNIVERSITY OF FLORIDA



3 1262 09079 7084

ORE
RU
CO

1

U.S

2

3

4

5